SOME HYDRODYNAMICAL METHODS[1]

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The famous lines

Geography is about maps,
Biography is about chaps

leave little to be desired in conciseness. About what is mathematics? To use a hydrodynamical metaphor I shall take the plunge and assert that mathematics is about the logical consequences of assumed propositions, nowadays called axioms. Thus all mathematics is one. The fancied distinction between "pure" and "applied" is a modern and false dichotomy unknown to Euler and Cauchy. To see this clearly, reflect on the investigations to which the objects of nature have given rise. Insofar as they are mathematical, these investigations have been concerned, not with the objects of nature themselves, but with models, that is to say with certain ideal objects which are defined solely by a set of precise statements concerning the properties to be attributed to these objects. With such a set of statements the mathematician is on firm and familiar ground, and he can follow the path wherever it leads; perhaps to paradox or perhaps to such results as may induce the opinion, it can be no more, that his model furnishes an explanation of the physical counterpart which inspired the original postulates. From this point of view the ocean wave of the mathematician smacks as little of salt as does the Riemann Hypothesis. Indeed the flavor of fluid is a property from which no mathematical inference can be made, and so flavor, perhaps regrettably, must be consigned to the consideration of the chemist or the connoisseur.

1. **Tensors.** It is becoming increasingly realized that the most insight giving statement of the equations of motion of continuous media in general and of fluids in particular is by means of tensors.

There are at least two ways of regarding tensors, namely as quantities attached to a coordinate system, or as intrinsic entities, the latter way presenting many advantages not the least of which is the absence of an irrelevant coordinate system. Our intrinsic definition of a tensor of rank n is recursive.

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